FIELD OF THE INVENTION

This invention generally relates to a pylon or barrier arrangement which is recessed into the ground or other surface, including a post-like pylon which is raised into an extended position for control of vehicular or pedestrian traffic.

BACKGROUND OF THE INVENTION

The control of vehicular traffic often requires that 10 certain lanes be closed to traffic and that traffic be temporarily be redirected to other lanes to accommodate variances in traffic flow, or as a result of repair work. It is also often necessary or desirable to control the ingress and egress of pedestrians in certain public 15 areas, such as in amusement parks, college campuses, and tourist areas. This type of traffic control is often achieved by manually positioning freestanding markers, such as upright cones or drums, at desired locations and then removing or shifting same as necessary. 20 solution is time consuming, and in the situation where cones are placed directly on roadways to control or restrict vehicular traffic, poses a hazard to workers who must necessarily enter the roadway where vehicles are often traveling at high speeds. 25

As such, various pop-up traffic control devices have been developed which include a cartridge or housing embedded beneath the ground or roadway surface and a pylon or bollard which is housed within the below-ground cartridge when not in use. The pylon is remotely activated to raise same into an uppermost position for controlling or restricting traffic. A number of such traffic control devices are installed in side-by-side spaced relation with one another along a roadway or other area to provide traffic guidance. For the purpose of raising and lowering the pylon, many of these

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conventional devices include a rotatably driven threaded shaft which is mounted within the embedded lower cartridge. The shaft engages with a screw nut which is fixed to the pylon so that the nut and pylon traverse up or down on the shaft depending upon the rotational direction thereof. Examples of such an arrangement are disclosed in U.S. Patent No. 5 425 595, and French Patent No. 2650-009.

The primary disadvantage of devices utilizing a screw-type mechanism to actuate the pylon is end-loading. 10 More specifically, abrupt axial end-loading of the pylon occurs when the pylon is driven downwardly, for example by a vehicle tire, when the pylon is rising from the roadway surface. This downward driving of the pylon and nut often results in a stripped nut, or more 15 significantly, the downward driving of the shaft itself which can cause damage to the motor and/or other internal components mounted within the lower area of the cartridge, such as the control board. These types of arrangements also include less than desirable sealing 20 capabilities, which can result in the accumulation of dirt and grit on the threaded shaft and thus an abraded or damaged screw nut and/or shaft.

Other conventional pop-up traffic control devices utilize pneumatic devices to raise and lower the pylon. However, these arrangements often require close tolerances within their construction to prevent leakage, and involve increased costs associated with installation of appropriate pneumatic lines in the roadway.

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with traffic control devices which are permanently installed in the roadway, exposure of the device to freezing temperatures can also present problems, such as ice formation adjacent the top of the cartridge which can restrict movement of the pylon. Conventional solutions to this problem included providing a heater disposed exteriorly of the pylon so as to heat the top cover or

flange located adjacent the roadway surface to melt the ice. However, since the top cover is typically of significant width and thickness dimensions, a high-wattage heater and considerable warm-up time are necessary. In addition, angled road grades often create complications with existing devices, wherein the interference between the top flange or plate and the pylon can jam or stall the motor.

The present invention relates to a retractable-type barrier or pylon arrangement including an extendible and retractable pylon or cylinder which is actuated by a drive mechanism capable of compensating for an abrupt axial downward movement of the pylon, thus avoiding damage to the drive mechanism itself and/or other internal components of the system. The invention also incorporates an improved sealing arrangement which minimizes the amount of water and debris entering the arrangement from the surface, and an improved heating system which requires less energy.

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More particularly, one aspect of the invention relates to a barrier arrangement including a generally tubular housing mounted within the ground so that an upper end thereof is generally flush with the ground surface. A post is disposed within the housing and is telescopingly movable relative thereto between an uppermost position wherein the post extends upwardly from the upper end of the housing and above the ground surface and a lowermost position wherein the post is disposed substantially completely within the housing and beneath the ground surface. A drive mechanism moves the post between the uppermost and lowermost positions, which drive mechanism includes a rotatable drive shaft having a smooth outer surface, and a block-like member disposed in clamping engagement with the smooth outer surface and non-movably fixed to the post. Rotation of the drive shaft causes displacement of the block-like member and

the post relative to and along the drive shaft to move the post into one of the uppermost and lowermost positions.

Another aspect of the invention relates to a retractable pylon arrangement including a generally upright cartridge embedded within an opening in the ground so that an uppermost end thereof is substantially level with the ground surface. A pylon is disposed in a telescoping manner within the housing and is movable between an extended position wherein the pylon is cantilevered upwardly from the ground and a retracted position wherein the pylon is positioned within the cartridge and beneath the ground surface. A remotelycontrolled drive mechanism moves the post between the extended and retracted positions, and an annular flange closes off the uppermost end of the cartridge. flange has an inner terminal periphery disposed in surrounding relation with the pylon which defines an opening to permit movement of the pylon between the extended and retracted positions. A flexible annular seal member is mounted on the inner periphery of the flange and extends inwardly so as to maintain contact with an outer surface the pylon during movement thereof.

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A further aspect of the invention relates to a pylon arrangement for controlling vehicular traffic including a generally hollow housing structure fixed within the ground in a generally upright manner, and an elongate pylon mounted for movement into the housing structure into a retracted storage position and for movement out of the housing structure into an extended position for controlling traffic. A heating unit is disposed within the pylon which when energized effectively heats an outer wall of the pylon and prevents seizure of the pylon due to ice build-up at least adjacent the ground surface.

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Other objects and advantages of the invention will
be apparent to persons familiar with structures of this
     De apparent to persons ramillar with following specification and general type upon reading arming
                                               Figure 1 is a perspective view of the retractable
            inspecting the accompanying drawings.
                           pylon arrangement according to the invention, with the
                                pylon or post in the fully extended or up position;
                                          Figure 2 is an enlarged overnead view of the line 2-2 in Figure 1:

arrangement as seen generally from the from the figure 2 in Figure 2 in Figure 2 in Figure 2 in Figure 3 in an enlarged from the figure 3 in an enlarged from the figure 2 in Figure 2 in Figure 3 in an enlarged overnead view of the figure 2 in Figure 3 in an enlarged overnead view of the figure 2 in Figure 3 in an enlarged overnead view of the figure 1:
                                                                        generic as seen generally along time 2-2 in rigure 1;

rigure 3 is an enlarged fragmentary cross-sectional
                                                   View taken generally retracted or down position.
                                                                                        In the rully recracted or down position; but with the Figure 4 is a view similar to Figure 3.
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                                                        pylon in the fully retracted or down position;
                                                                                                  Figure 5 is an enlarged cross-sectional view taken
                                                                  pylon in the fully extended or up Position;
                                                                                                             Figure 6 is an enlarged fragmentary view of the
                        10
                                                                               generally along line 5-5 in Figure 3;
                                                                                                                      Figure 7 is an end view of the linear drive or
                                                                                                   actuator and drive shaft as seen generally along line actuator and the property and drive shaft as seen generally along line actuator and drive shaft as seen generally along line 7-7
                                                                                        linear drive or actuator and drive shaft;
                                                                                                                                      Figure 8 is an end view of the actuator and drive
                                                                                                                  shaft as seen generally along line 8-8 in Figure 6.
                                                                                                                                                 as seen generally along will be used in the following certain terminology will be used in the following.
                                                                                                                             description for convenience in reference """

description for convenience ""

description for convenience """

description
                                                                                                                                 description for convenience in reference only, and with words "upwardly", and be limiting.
                                                                                                                                       not be limiting. For example, the words "upwardly" will refer and "leftwardly" will refer and "leftwardly" and "reference is made and "high reference is made and "high reference is made and "leftwardly" and "reference is made and "leftwardly" is made and "leftwardly" is made and "leftwardly" and "reference is made and "leftwardly" is made and "leftwardly" and "leftwardly" is made and "leftwardly" and "le
                                                                                                          in Figure 6; and
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                                                                                                                                                to directions in the drawings to which refer to

The words "inwardly" and "cutwardly" will refer to
                                                                                                                                                     The words "inwardly" and away from respectively!

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geometric center of the arrangement and the morae

thereof
                                                                                                                                                                     thereor.

Specifically mentioned, derivatives thereof, and words of specifically mentioned.
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                                                                                                                                                                            similar import.
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Referring to the drawings, and particularly rigures Releting or pylon arrangement 10 is illustrated

a barrier or pylon arrangement 10 is illustrated The arrangement 10 generally includes a rigid tubular outer cartridge or generally includes a rigid tubular outer cartridge or nousing 11, and a post or pylon 12 which is telescopingly housing 11, and a post or rarridge 11 me cartridge 11 housing within outer cartridge 11 and a post or pylon 11 me cartridge 11 and a post or pylon 11 me cartridge 11 and a post or pylon 11 me cartridge 11 and a post or pylon 11 me cartridge 11 and a post or pylon 11 me cartridge 11 and a post or pylon 12 me cartridge 11 me cartridge 11 and a post or pylon 12 me cartridge 11 me ca according to the present invention. nousing it am a post of pyron is which is cerescoping arranged within outer of a craft age in a cartridge in a cartridge. arranged within outer cartifuge it. The cartifuge it and is generally has the shape of an elongate cylinder; and in generally generally nas the shape of an elongate the ground in a embedded substantially entirely the important enweuveu Supstantially entirely within the uppermost end generally upright manner so that the uppermost generally uprignt manner so that the road or ground thereof is substantially flush with the road according thereof. thereof 19.

Surface 19.

Surfa surface 19. and is movable between an extended position cylindrical and is movable between an extended position and is movable between an extended position and is movable between an extended position and is movable between an extended position. cylinarical, and 4) wherein the pylon 12 projects upwardly (Figures 1 and 4) (rigures 1 and a) wherein the pyton 14 projects upward and a retracted position (Figure 3). wherein the pylon 12 is marrament of the marrament wherein the partridge 11 wherein the cartridge 11.

within the cartridge arise machinism is a shipper at the pylon arise machinism. within the cartifuge in mechanism 17 including an elongate achieved via a drive mechanism 27. acnieved via a drive mechanism is including an elongate; and active shaft of retains vertically oriented and rotatable drive shaft or retains vertically oriented and rotatable drive or retains and rotatable drive shaft. 10 vertically oriented and defining an axis of rotation smooth outer surface and defining an axis. Drive shaft 18 is rotatably but axially rigid outer tube 13 and a rigid inner tube 14 which is stationarily mounted within cartridge 11. disposed generally concentrically within outer tube 13. disposed generally concentrically within outer tube 13.

disposed generally concentrically within outer tube 13 is open at outer tube 13 is open at outer tube 13 is open at outer tube 13.

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A plurality of plate-like support over the inner end wall or cap 15. A plurality or plate-like support tube 13 to the inner surface of outer which blocks 20 are fixed end thereof wie feateners. 20 plocks 20 are rixed to the limer via fasteners for the lower adjacent the lower and thereof via fasteners. adjacent the lower end thereof via rasteners 21, which adjacent the lower end the vertical support for the inner support blocks 20 provide vertical inor chair and a support blocks are the support blocks and a support blocks are the support blocks and a support blocks are the support blocks. support procks to provide vertical support for the link tube 13.

Additional spacer blocks (not shown) may be tune 13. Additional spacer plocks (not snown) may per provided between the outer and inner tubes 13 and 14. provided petween the outer and inner tubes inner tubes

provided petween the ends thereof.

adjacent the upper ends rigid right righ adjacent the upper ends thereof. Tigid Plastic, such as 13 and 14 may be constructed of rigid Plastic. PAC bibe. 35

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The vertical length of inner tube 14 is slightly
The vertical length of outer tube 13: 50 that the vertical length of one of the the length of outer tube is a series of the than the vertical length of one of the theory 
               Less than the vertical length of outer tube 14 is spaced vertically upwardly the cap 15 of inner and of outer tube tube 14 is spaced vertically inner and of the cap 15 of and of outer tube 14 is spaced vertically upwardly tube 15 cm the inner and of outer tube 13 and the inner and of outer tube 13 and the inner and of tube 15 cm tube 1
                             the cap 13 of limer tupe 14 15 spaced vertically upwardly from the lower end of outer tupe 13; and the upper end of from the lower end of outer distance downwardly upwardly upwa
                                           Irom the lower type and of outer type and the upper end of outer type distance downwardly from a short distance downwardly from a short type 14 is spaced a short type 12 inner type 14 is spaced of outer type 13 inner type 14 is spaced of outer type 15 inner type 15 inner type 16 inner type 16 inner type 17 inner type 17 inner type 18 in
                                                           Inner tupe 14 15 spaced a snort tupe 13.

Inner tupe terminal end of outer tupe 13.

the upper terminal 22 is fixed to the innerment end of the upper terminal end of the upper terminal end of the upper to the uppe
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                                                                                        prace tube 14 by a plurality of angled or france 22 which are fixed to france 22 which are fixed 22 whi
                                                                                                      Inner tupe 14 Dy a piurality or angled or corner-snaped tupe support brackets 23 which are fixed to flange 22 and tupe inner eare of flange 23 and tupe inner eare of flange 22 and tupe inner eare of flange 22 and tupe inner eare of flange 22 and tupe inner eare of flange 23 and tupe inner eare of flange 24 and tupe inner eare of flange 25 and tupe inner eare of
                                                                                                                    Support prackets 23 which are inner edge of flange 22 defines

The inner edge of which defines

14 via fasteners 24.
                                                                                                                                      a generally centrally oriented opening 25 which defines
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                                                                                                                                                                 an upper access opening inner tube 14. Further, a pair of 26 defined within inner tube 14.
                                                                                                                                                                                 agerined witches 28 and 28A are mounted on annairmnt the mounted on switches 28 and 28A are mounted on the outer the mounted outer the mou
                                                                                                                                                                                             switches 28 and 200A are mounted on the outer switches or the switches are mounted embodiment, the switches or inner tube 14.
                                                                                                                                                                                                             Inner two 14. In the preferred embourment, the switches or 28 and 28A are conventional Hall-effect switches.
                                                                                                                                                                                                                               sensors and are mounted in vertically spaced relation
                                                                                                                                                                                                                                          sensors and are mounted in vertically spaced relation discussed from one another on tube 14 for a purpose as another or tube 15 for a purpose an
                                                                    20
                                                                                                                                                                                                                                                      below.
                                                                                                                                                                                                                                                                      Derow.

Utilized with the invention, such as conventional limit invention, such as conventional limit invention.
                                                                                                                                                                                                                                                                                                                                                                            An upper annular plate-like flange or cover 30
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(preferably of metal)
                                                                                                                                                                                                                                                                                                                                 (Preceraply of metal) such as scaliness sceed and is spaced to the uppermost end of outer tube 13 and is spaced
                                                                                                                                                                                                                                                                                                                                                 slightly vertically above lower flange 22.
                                                                                                                                                                                                                                                                                                                                                               slightly vertically above lower tube 13 by a plurality the outer tube 13 by a primary and to the outer tube from one another flange 30 is fastened to mich are change and from one another flange 30 is fastened to the outer tube are changed from one another flange 30 is fastened to the outer tube 13 by a plurality of the outer tube 14 by a plurality of the outer tube 15 by a plurality of t
                                                                                                                                                                                                                                                                                                                                                                            tlange 30 is tastened to the outer tupe 13 py a piurality

of fastening blocks 31 which are spaced from one another

of fastening blocks of the important and of the important are spaced from one another
                                                                                                                                                                                                                                                                                                                                                                                            or rastening procks at which are spaced trong tube 13 to the uppermost end of factorian about the outer surface of the uppermost and the about the outer surface of the uppermost and the uppermost and the uppermost and the outer surface of the uppermost and the uppermost an
                                                                                                                                                                                                                                                                                                 switches.
                                                                                                                                                                                                                                                                                                                                                                                                          about the outer surface of the uppermost end of tube 13

about the outer surface of the uppermost end of fasteners

32. Additional fasteners

32. and fixed thereat by fasteners important the important fasteners

and fixed thereat downwardly through the important fasteners.
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                                                                                                                                                                                                                                                                                                                                                                                                                        and rixed chereat by through the upper surface of flange through the rementive hinche 31 and of the rementive hinche 31 and 32 extend downwardly through the rementive hinche 31 and 32 extend downwardly the top and of the rementive hinche 31 and 32 extend downwardly the top and of the rementive hinche 31 and 32 extend downwardly the top and of the rementive hinches 31 and 32 extend downwardly the top and of the rementive hinches 31 and 32 extend downwardly the top and of the remential top and of the remential top and 32 extend downwardly the top and of the remential top and 32 extend downwardly the top and of the remential top and of the remential top and 32 extend downwardly the top and of the remential top and 32 extend downwardly the top and of the remential top and 32 extend downwardly the top and 32 extend downwardly the top and of the remential top and 32 extend downwardly the top and 32 extend downwardly 
                                                                                                                                                                                                                                                                                                                                                                                                                                       32 extend downwardly end of the respective blocks 31.
                                                                                                                                                                                                                                                                                                                                                                                                                                                   Upper flange 30 defines a generally centrally oriented
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     opening 27 which is aligned with opening 25 of lower
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                A sealing arrangement 33 sealing arrangement 33 sealing arrangement 7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            A sealing arrangement 33 is provided at the
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              flange 22.
                                                                                                                                                                                                                                                                                                                                                                                                                                                   35
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includes a pair of flexible and ring-like seals 35 and 36
                                                                                                                                                                                                                                            which are vertically stacked on one another and
                                                                                                                                                                                                                                     Sandwiched between the upper and lower surfaces of the surface
                                                                                                                                                                                                                              respective flanges 22 and 30 adjacent the inner
                                                                                                                                                                                                                     peripheries thereof. In the illustrated embodiment, seal
                                                                                                                                                                                                                rings 35 and 36 are Constructed of silicone rubber,
                                                                                                                                                                                                        although other flexible sealing materials may be utilized
                                                                                                                                                                                                    in accordance with the present invention.
                                                                                                                                                                                           peripheries of the seal rings 35 and 36 extend
                                                                                                                                                                                    horizontally beyond the inner peripheral edges of flanges

reanantiva maninna 27
                                                                                                                                                          10
                                                                                                                                                                             and 30 which define the respective obeniuse 52 and 54 and 54 and 54 and 54 and 54 and 54 and 55 and 55 and 56 and 
                                                                                                                                                                     and contact the outer surface of pylon 12 at all times so into the
                                                                                                                                                               as to prevent the entry of water and/or debris into the and contact the court of the contact of 
                                                                                                                                                        interior of Cartridge II. In one empodiment, one of the
                                                                                                                                                 seals 35, 36 (i.e. the lower seal) is somewhat more rigid

on as to hyphysical more rigid
                                                                                                                          15
                                                                                                                                          than the opposed seal, so as to provide support thereto

coaling amport thereto
                                                                                                                                    and avoid over-flexing thereof. Sealing arrangement 33
                                                                                                                            Optionally also includes a ring-like strip 34 positioned
                                                                                                                     petween the upper and lower surfaces of the respective petween the noner and lower a truncative series of the respective petween the notion of the respective series of the respective petween the notion of the respective series of the respective petween the notion of the respective series of the 
                                                                                                               flanges 22 and 30, generally adjacent the outer periphery

The the fillinger rate of ambout many etrin
                                                                                                       of lower flange 22. In the illustrated embodiment, strip

and is fived to the inner and inner an
                                                                                                 30 is of a foam material, and is fixed to the upper and
                                                                                           lower flanges 22 and 30 Via adhesive.
                                                                                                                      The pylon 12 is mounted within the interior chamber
                                                                            26 Of inner tube 14, and includes an elongate and
                                                     25
                                                                    generally cylindrical hollow tube 40 having a lower
                                                              Aerier arth character and the second and the second
                                                       Open end closed Off With a cap 41A. Base 41 and an cap 41A is annular
                                                 in configuration so as to define a centrally oriented
                                         through hole 42. Base 41 is fixedly mounted atop a ring.
                  30
                                  Like hub 43 which defines an opening 44 therethrough
                            which is generally aligned with through-hole 42.
                    40, hub 43 and base 41 are dimensioned so that the outer and the outer
              diameters thereof are uninensity than the inner diameter of
       therewithin. An annular wiper or brush 45 is mounted
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Within hub 43 and is recessed upwardly and into a lower
           surface thereof. In the lithestated embourned, problem ends includes a plurality of bristles 46 having outer as:
                            which are which are the fixed to an outer ring and extend radially
                                        which are liked to an outer the free inner ends of the inwardly therefrom so that
                                                 Invalually thereform the outer surface of the drive shaft in arise about the outer surface of the drive shaft in arise about the outer surface of the drive arise about the outer arise are also are al
                                                           Dristles contact the outer surface of the extends upwardly

As shown in Figure 3: the oraning // of his /2

Through househ // or his /2

Through househ // or his /2
                                                                        As snown in rigure 3, the arive snart is extends upwarding through brush 45, opening 44 of hub 43, through brush 45, opening 44 of hub 43, of the holder of 
                                                                                 of base 41 and into the hollow interior of tube 40.
                                                                                           or pase a permanent magnet 50 is embedded within hub 43 ruther; Further, and an analysis and analysis analysis and analysis analysis and analysis analysis and analysis analysis analysis analys
                                                                                                        so as to be generally flush with an outer periphery
                                                                                                                                                                                                                De yenetarty further below! sensors 28, 28A
                                                                                                                           excension of pyron blocks 50A are mounted to the A plurality
                                                                                                                                                           inner surface of inner crom handle con more to a mit to
                                                                                                                                                                                                                                                                                                                                                                                                             stop blocks 50A serve to limit the
                                                                                                                                                                             Upward extension of pylon 12 from cartridge 11 through
                                                                                                                                        lower extension of pylon 12.
                                                      10
                                                                                                                                                                                                                                                   with reference to Figure 5, hub 43 defines therein
                                                                                                                                                                                                           with reference to rigure 31 num 43 wellnes therein, with reference to rigure 31 num 43 wellnes there guide two diametrically opposed and vertically elongate guide.
                                                                                                                                                                                          abutting contact with hub 43 (Figure 4).
                                                                                                                                                                                                                      alametricarry opposed and verticarry evolution from the outer periphery sidewardly from the outer periphery slots 51 which open sidewardly concerns of the outer periphery slots 51 which open sidewardly concerns of the outer periphery opposed and verticarry evolution from the outer periphery evolution from the outer periphery opposed and verticarry evolution from the outer periphery evolut
                                                                                                                                                                      22 Via fasteners 50B.
                                                                                                                                                                                                                                  Shore of A pair of Vertically elongate guide bars thereof.
                                                                                                        15
                                                                                                                                                                                                                                          the illustrated embodiment are constructed of which in
                                                                                                                                                                                                                                                   which in the litustrated emponiment surface of inner tube 1 are fixed to the inner surface of inner are fixed to the inner surface of inner aluminum, are fixed to the inner surface of inner in inner surface of inner i
                                                                                                                                                                                                                                                              aluminum, are fixed to the inner surface of inner tupe land opposed locations (and the remarking opposed locations) and the remarking opposed locations the remarking via fasteners 53 in diametrically offers from the remarking via fasteners of remarking the remarking via fasteners of remarking via fasteners are remarking to the remarking via fasteners of remarking via fa
                                                                                                                                                                                                                                                                          Via laburilety offset from the respective of the corrective of the circumferentially offset from the respective of the second of the respective of the respe
                                                                                                                                                                                                                                                                                     so as to be circumterentially offset from the respective slots

stop blocks 50A) and engage within the respective from the respective slots

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stop blocks from the respec
                                                                                                                                                                                                                                                                                                                                  p plocks SUA) and engage within the respective storal configuration guide bars 52 have a cross-sectional configuration
                                                                                                                                                             20
                                                                                                                                                                                                                                                                                                        similar to the cross-sectional configuration of the
                                                                                                                                                                                                                                                                                                                             respective stors of the vertical extent of inner the substantial portion of the reconstruction of the reconstr
                                                                                                                                                                                                                                                                                                                                     Subscalled purchall of the guide bars 52 within the 141 and the engagement of the guide bars 32...
                                                                                                                                                                                                                                                                                                                                                respective slots 51 guides the pylon 12 during raising
                                                                                                                                                                                                                25
                                                                                                                                                                                                                                                                                                                                                           and lowering thereof relative to cartridge 11 and
                                                                                                                                                                                                                                                                                                                     respective slots 51.
                                                                                                                                                                                                                                                                                                                                                                    and rowering chereto of pylon 12 relative thereto.

prevents rotation of pylon 2
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With reference to Figures 3 and 6-8, drive mechanism
wich reference to drive shaft the smooth outer outer of the addition to drive and the shaft the smooth outer outer of the shaft the smooth outer outer
           or actuator 54 which engages the smooth outer surface of or actuator 54 which reference actuator saturator saturator
                         or accuator by which engages the smooth outer surrace or into linear motion thereof into linear shaft 18 and translates motor se ...high arises that 18 and an electric motor shaft 18 and
                                    shall to and an electric motor 55 which drives o in motion and an electric motor of in right and an electric
                                                  morion, and an electric moror as whiteh orives 6-8 is

The linear drive 54 illustrated in Figures 6-8.
                                                             disclosed in U.S. Patent No.
                                                                           alsclosed in U.S. Fatent NO. 4 74 oyo which is neverly only a incorporated by reference herein.
                                                                                      brief description of drive 54 will be provided.
                                                                                                                                                                  Drive 54 includes a mounting block 56 and an
                                                                                                                 adjusting block 60 which are joined together in opposed
                                                                                                                             adjusting plock 60 which are joined together in opposed (only one of which is fasteners 61 (only one of which is relation by a pair of fasteners about 10 rearest and relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation by a pair of conductor drive about 10 relation 10 relation by a pair of conductor drive about 10 relation 10 rel
                                                                                                                                          relacion by a pair of laborater shaft 18 therebetween.

shown) so as to sandwich drive shaft 1, therebetween.
                                                                                                                                                    snown) so as to sanowich arive shat the respective heads

The fasteners and are mounted so that the respective of the fasteners and are mounted so that the respective of the fasteners and are mounted so discount the fasteners and are mounted so discounted the fasteners and are mounted so discounted the fasteners are also are mounted to the fasteners are also are mounted to a so discounted the fasteners are also are mounted to the fasteners are also are al
                                                                                                                                                                The rasceners of are amounted so that the outer side or adjustment ends are exposed adjacent the outer and adjustment or adjustment.
                                                                                                                                                                               or adjusting block 60 and the inner threaded surface of adjusting block.
                                                                                                                                                                                           surrace of acquesting prock of and threaded bore of the shaft ends are engaged within a threaded bore of the shaft ends are engaged.
                                                                                                                                                                                                      snart ends are engaged within a threaded block 56.

opposite mounting to a second of the specific property of the second of the 
                                                                                                                                                                                                                  opposite mouncing block 36. the clamping force of the thereon a spring 62 so that
                                                         10
                                                                                                                                                                                                                             thereon a spring 52 so that the clamping force of the the clamping force of the manipulating adjustable by manipulating force of the compression o
                                                                                                                                                                                                                                           respective plocks 50 and ou is adjustable by manipulating 62.

The respective fasteners for an analysis of the respective fasteners fasteners for an analysis of the respective fasteners fasteners fa
                                                                                                                                                                                                                                                      the respective raster size of locator size of 
                                                                                                                                                                                                                                                                               Dy a Palr of locks 56, 60.

The mounting block 56 mounts a respective blocks on each avial and thereof respective hearing 64 on each avial and thereof
                                                                                                                                                                                                                                                                  by a pair of locator pins 63 mounted within the
                                                                                                                                                                                                                                                                                                         roller pearing by on each axial end thereof, and content two roller hearings and content two roller hearings and content adjusting block 60 mounts roller hearings of and content adjusting block for the roller hearings and thereof
                                                                                                                                                                                                                                                                                           roller bearing 64 on each axial end thereof, and
                                                                                                                                                                                                                                                                                                                      adjusting plock by mounts two roller bearings 64 and 65, as and a second thereof.

axial end thereof. These roller bearings are reserved at an analysis axial end thereof.
                                                                                                                                                                                                                                                                                                                                axial end thereor. Tand 81 are oriented at an angle best shown in Figures 10% of the Aritime about 10 and the best shown
                                                                                                                                                                                                                                                                                                                                             DEST SHOWN IN FIGURES 18A OF the drive shaft 18 50 that the axis 18A of the drive shaft 18 700000 relative to the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the axis 18A of the drive shaft 18 50 that the drive 
                                                                                                                                                                                                                                                                                                                                                           relative to the axis is a longitudinally displaced along the blocks so and 60 are longitudinally displaced along
                                                                                                                                                                                                                                                                                                                                                                                                                                              Linear drive 54 is mounted to hub 43 by a corner
                                                                                                                                                                                                                                                                                                                                                                                                 drive shaft 18 upon rotation thereof.
                                                                                                                                                                                                                                                                                                                                                                                                                        wnich is liked to the lower surface of num 43 with for shaft opening 71A therein for shaft and defines an opening 72 which denonde fasteners 71 and defines france 72 which denonde
                                                                                                                                                                                                                                                                                                                                                                                                           snaped pracket oo naving an upper nortzontal Liange which is fixed to the lower surface of hub 43 with
                                                                                                                                                                                                                                                                                                                                                                                                                                    18, and a lower vertical flange 72 which depends
                                                                                                                                                                                                                                                                                                                                                                              35
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downwardly from an end edge of flange 70 and is fixed to The lowermost terminal end of drive, shaft 18 is one of the blocks 561 nonrotatably connected to an output shaft are which in constructed of nonrotatably connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed of a florishing the connected to an output shaft are which in constructed to a florishing the connected the connected to a florishing the connected nonrotatably connected to an output share is constructed of a flexible through a coupling 75 which is constructed of a flexible through a coupling 13 which is so as to compensate for any material, hermen the remarkable ehafte in and 74 material for example funder, so as to compensate for a 74.

misalignment between the respective shafts 18 and 74. mlsallgnment perween the further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in the lateral the drive shaft 18 is further supported in th The arive shall to is further supported in the clamping engagement of blocks him and direction and the comparison of blocks and the clamping engagement are an to him and the comparison of blocks are the blocks and the comparison of blocks are the bl thereon and the connection of inner time 14 hir a which hub 43 in the 12 har and of inner time 14 hir a which hub 43 in the 12 har and of inner time 14 hir a which hub 43 in the 12 har and of inner time 14 hir a man a wnich nup 43 in the lower end of inner tube 14 by a mounted within the lower end of inner tube mounted within the lower end of inner tune and rigid mounting plate oriented and rigid mounting of inner tune and rigid mounting plate oriented and rigid mounting or tune and oriented and rigid mounting or tune and oriented and rigid mounting or tune of the inner curface of inner tune and oriented and rigid mounting plate. The winter fasteners 77.

With fasteners 77. opening unrough which moving 15. An annular lip seal coupling 15. An arrivation and is enringed an and is enringed an and is enringed connection to flexible anening an and is enringed an analysis of the connection to flexible anening an analysis enringed an analysis of the connection to flexible anening an analysis enringed and analysis of the connection to flexible anening an analysis of the connection to flexible anening an analysis enringed and another anening an analysis of the connection to flexible and the connection the connection to flexible and the connection the connec opening through which motor shaft 74 extends for connection to treatme completing is spring loaded so and is spring loaded so as is mounted within opening to the contract of t Bl ls mounted within opening by and is spring-loaded so the seal and the between the seal and the as to maintain constant pressure here of environment of maintain the seal and the as to maintain the seal and the s 10 as to maintain constant pressure petween the seal and the output shaft 74 of motor 55.

Output shaft 74 of motor 55. output snatt have be utilized is commonly known as an oil seal which may be utilized or short and it remains to the seal which may be utilized as a short and it remains to the seal which may be utilized as a short and it remains to the seal which may be utilized as a short and it remains to the seal which may be utilized as a short and it remains to the seal which may be utilized as a short and it remains the seal which may be utilized as a short and it remains the seal which may be utilized as a short and it remains the seal which may be utilized as a short and it remains the seal which may be utilized as a short and it remains the seal which may be utilized as a short and it is a short seal will in the used as a shaft seal in various types of seal typically used as a shaft seal will in typically used as a shaft seal will be a shaft seal wi pump mechanisms. 15 pump mechanisms. Alternatively, a tunner yazhet ma.

the top of motor 55 and the lower provided between the top of motor 55. provided between the top of motor 33 and the lower 74. The mounting plate 76 divides the interior chamber The mounting place to alvices the fine two to and a lower compartments and lower tube 14 into upper and the following the min of the fine tube 14 into upper and the following the min of the following the fine tube 14 into upper and the following the min of the following the followi and 83.

The upper compartment solves the pylon of the upper compartment solves the pylon of the solves the and 83. The upper compartment 84 the lower compartment 83

12. drive 54 and shaft 18. control houses the pylon
12. the mator se and a control house sent laborates the mator se and a control house sent laborates the mator se and a control house sent laborates the mator se and a control house sent laborates the mator set and a control house sent laborates the mator set and a control house sent laborates the pylon 83 20 houses the motor 55 and a control board 55A (shown schematically only).

Seal 81 thus prevents water from schematically only). schematically only! Seal by thus prevenus water from and other potential with lower compartment 831 and other potential with lower compartment 23 are easied with lower compartment 24 are easied with lower compartment 25 are easied wi entering the lower compartment with and other potential with lower compartment and other sealed with lower compartment and other potential and other sealed with lower compartment and other sealed with lower sealed wi Teak hornes sealant or other appropriate sealant. a sillcone sealant or other appropriate inner tube 14 is entry of some water and debris with a sillcone sealant or other appropriate into the inner tube and debris with a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube 14 is a sillcone sealant or other appropriate into the inner tube in th entry or some water and depris into the inner tupe la is the large of and depris into the inner tupe la is the large of and depris into the inner tupe la is the large of the into the 30 35

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the type disclosed herein, drain holes le in the wall of
                                                                       inner tube 14 allow escape of fluid from upper
                                                                       compartment 82.
                                                                             Referring to Figure 3, the upper end of drive shaft
                                                                 Is mounts thereon a thrust bearing 84. A heating unit 85
                                                               is mounted within the interior of pylon tube 40 on the
                                                             side of the thrust bearing 84.
                                                           embodiment, the heating od.

on only horror is a low-wattage, rubber
                                                         encapsulated, 24 Volt heater. Further, a lighting
                                                      encapsulatea,
arrangement 86 is provided within pylon tube 40. The
                                               10
                                                    lighting arrangement 86 includes a LED light cluster
                                                  Mounted to the thrust bearing 84 just below the roadway
                                                Surface 19 so as to illuminate the entire pylon tube 40
                                              when in the upwardly extended position (Figures 1 and 4).
                                            The bearing 84 in the illustrated embodiment is lined
                                     15
                                          with Teflon to permit low-friction rotation of the shaft
                                       18 relative to bearing 84, so that heating unit 85 and
                                     lighting arrangement 86 are maintained essentially
                                     stationary.
                          20
                                            The Pylon arrangement 10 in the illustrated
                               embodiment is controlled from a remote location with an
                             electronic couprol panel (not shown) which communicates

electronic ta control panel trom a remote

or shown) which communicates
                           with the control panel (not snown) which communicated in the control board 55A either wirelessly via radio
                         signals or by means of a direct electrical connection.
                25
                                 The motor 55, control board 55A, heating unit 85,
                    lighting arrangement 86 are electrically connected via
                  wiring 95 (shown in dotted lines) to a power pack or
                Module 96 (shown schematically) mounted adjacent the
              Ground surface 19 and connected to a power source.
            Wiring 95 leading to lighting arrangement 86 and heating
     30
          unit 85 may be encased within flexible tubing 96 to
       protect the wiring and to minimize wear thereof due to

may be encased within the control of the
     Protect the wiring and to minimize wear thereof que to the artarior of thing 95 within tube 40
    May be routed to the exterior of tube 40 by extending the
 wiring downwardly through opening 42 in base 41, through
an Orifice (not shown) in hub 43 and then Outwardly
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through an opening (not shown) in inner tube 14. The wiring 95 within lower chamber 83 is also routed through an opening (not shown) through the wall of inner tube 14. Likewise, wiring 95 routed between inner and outer tubes 13 and 14 is routed through an opening (not shown) through the wall of outer tube 13 to power pack 96. It will be appreciated that the openings in inner and outer tubes 14 and 13 for routing wiring 95 are sealed around the respective wires to prevent entry of water or other contaminants. Communication cabling may also be routed through power pack 96 to control board 55A. The arrangement 10 is also typically connected to other pylon arrangements 10 via electrical and communication cabling.

As mentioned above, the cartridge 11 is mounted below ground level by embedding same in a pre-formed hole. If desirable or necessary, gravel or other material, such as concrete, may be used as filler around the outer surface of outer tube 13 to stably position the cartridge 11 in the ground. The cartridge 11 is mounted within the ground at a depth so that the top flange or cover 30 is substantially flush with the roadway or ground surface 19.

In operation, when raising of the pylon or pylon 12 from the lowermost position illustrated in Figure 3 is desirable or necessary, the appropriate input command is entered into the control board 55A via a remotely-located control panel (not shown) to energize motor 55 and rotate the drive shaft 18. Upon rotation of the drive shaft 18, the linear drive 54 and pylon 12 translate upwardly relative to drive shaft 18. The respective upper and lower switches or sensors 28 and 28A are mounted on inner tube 14 in axial locations which correspond to the axial position of the magnet 50 when the pylon 12 is in the extended and retracted positions, respectively. Once the pylon 12 has reached the upper position wherein the upper surface of hub 43 abuts or is disposed closely adjacent

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stop blocks 50A and magnet 50 is axially adjacent upper
                                                                                                                                                                                                                                               Sensor 28, sensor 28 senses magnet 50 and emits a signal stop of the sense of the s
                                                                                                                                                                                                                                        to deenergize motor 55 and stop further upward
                                                                                                                                                                                                                                 advancement of the Pylon 12 relative to shaft 18.
                                                                                                                                                                                                                          28 also indicates that the pylon 12 is in the up or
                                                                                                                                                                                                                  fully-extended position. A grouping of pylons 12 in
                                                                                                                                                                                                            their uppermost raised positions can thus be used to
                                                                                                                                                                                                   restrict travel within certain traffic lanes or areas.

The strict travel within traffic lanes or areas.

The strict travel within traffic lanes or areas.
                                                                                                                                                                                              whether Vehicular traffic or Dedestrian traffic.
                                                                                                                                                                                      illustrated embodiment, the approximate height of the
                                                                                                                                                              10
                                                                                                                                                                             pylon 12 in the up position as measured from ground level
                                                                                                                                                                        19 is approximately 3 feet. The pylon 12 can then be
                                                                                                                                                                 Towered into the retracted position shown in Figure 3 by

Towered approximates a teer.
                                                                                                                                                           entering the appropriate input command into the control of the desired for the control of the co
                                                                                                                                                  bauel to effectively tenerse the bolatity of the motor entertains the appropriate them.
                                                                                                                                            55, Which reverses the rotational direction of drive
                                                                                                                                     Shaft 18 and causes the pylon 12 and drive 54 to traverse

Once the pylon 22 and drive 54 to traverse
                                                                                                                              downwardly relative to shaft 18. Once the pylon 12 is
                                                                                                                      has reached the down or lower position wherein magnet 50
                                                                                                               is axially adjacent lower position wherein magnet of the gones of 28A, sensor 28A senses
                                                                                       20
                                                                                                         magnet 50 and emits a signal to deenergize motor 55.
                                                                                                  Sensor 28A also indicates that the pylon 12 is in the
                                                                                          Sensor < &A also indicates that the pylon is ranaived
                                                                                     the bilou is can be defected when no sidual is received the transfer of the tr
                                                                              from either of sensors 28 and 28A.
                                                     25
                                                                                                          In the event of a sudden downward driving movement
                                                               of the moder of a summary and attended monoment of the properties 
                                                       thereof into the upwardly extended position (for example
                                                 when the pylon 12 is less than about six inches above the
                                          top flange 30), for example when a vehicle tire or other the prince above the prince of other
                                  Object forces the pylon tube 40 downwardly, the linear
                           drive 24 acts as a clutch which decombles the bylou 15 content to the phone and the content to the phone and the content to the phone and the content to the
                     from the drive shaft 18. More specifically, the contact wrive and rive specifically.
            between the snart is.

And the amounth drive shart is nrowided linear drive
      24 and the swooth drive shalf 18 blonides a sattlicient of the router of
level of linear thrust required to raise and lower the
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pylon 12. However, the drive 54 acts as a linear clutch by slipping downwardly on the drive shaft 18 when the pylon 12 is acted upon by an axial load which exceeds a predetermined threshold as determined by the adjusted clamping force of blocks 56, 60 on shaft 18. When this predetermined threshold is exceeded, the pylon 12 breaks free of its positive engagement with the shaft 18 and translates downwardly relative to the shaft 18 until the source of overload is removed. Once the downward force on the pylon 12 is removed, the pylon 12 once again translates up the shaft 18 to its maximum height above the ground surface 19. Thus, damage to the interior components located within the inner tube 14 is avoided, for example, damage to the motor 55 and/or control board 55A within lower compartment 83. Damage to the drive mechanism 17 itself is also avoided.

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In one application of the illustrated embodiment, the end loading force applied to the pylon 12 and transmitted through the drive shaft 18 due to an abrupt downward movement of pylon 12 is minimal. In contrast, if such an abrupt axial force is applied to a conventional arrangement utilizing a threaded shaft and screw nut, the shaft and nut can be damaged, in addition to the damage which can be caused by the downward driving of the shaft into the lower end of the cartridge.

Further, for vehicle traffic applications, the pylon tube 40 is preferably constructed of a flexible, yet semi-rigid and durable and resilient material, such as polyethylene plastic. As such, when a lateral force is applied to the pylon tube 40 whether in the fully extended position or when rising from the cartridge 11, the tube 40 will yield under the lateral force and bend sidewardly. When the force is removed, the pylon tube 40 will essentially regain its original upright

35 configuration. In addition, it is also advantageous to

provide the pylon tube 40 with a bright color, such as yellow or orange, so that same is easily visible.

The sealing arrangement 33 located at the upper end of the cartridge 11 is also advantageous. Water and debris can severely limit the reliability and operation of a below-ground pylon arrangement, and preventing water and contaminants from entering the interior of the arrangement is thus highly desirable. The flexible seals 35 and 36 as shown in Figures 3 and 4 maintain contact with the outer surface of the pylon tube 40 regardless of 10 the position thereof, i.e. whether the pylon tube 40 is in the fully retracted or extended position, or moving between these two positions. The flexible seals 35, 36 significantly minimize intrusion of debris and liquid into the arrangement throughout the life-cycle thereof. 15 However, in time and through normal usage, the seals 35 and 36 wear and the roundness of the pylon tube 40 changes due to repeated collisions with vehicles. the drainage holes 16 in the inner tube 14 allow the escape of fluid from the upper compartment 82. 20 addition, the brush or wiper 45 cleans the smooth shaft 18 of any debris during each stroke of the pylon 12, and the lip seal 81 prevents entry of water and debris into the lower compartment 83. In contrast, pylon arrangements utilizing a threaded drive shaft arrangement 25 are prone to jamming during operation due to the accumulation of contaminants on the threads of the drive Thus, the arrangement according to the invention is more reliable than a threaded drive arrangement in a wet, grit-filled environment. 30

Variations in road grade are common and to accommodate same, the inner diameters of the upper and lower flanges 30 and 22 of the pylon arrangement 10 are significantly larger than the outer diameter of the pylon tube 14 such that a horizontal gap 91 is defined therebetween. This gap 91 allows for at least some

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angular and/or axial misalignment between the pylon tube 40 and the flanges 30 and 22. Further, the flexible seals 35, 36 extend over this gap 91 and permit angular misalignment of the tube 40 and the flanges 30 and 22. This arrangement is an improvement over conventional devices in which interference between the top plate and the pylon often prevent the pylon from rising, and cause warping or bending of the top plate due to overloading.

Further, the heating unit 85 is advantageously located within the interior of the pylon tube 40. This 10 arrangement heats the air within the pylon tube 40 so that heat is transferred via conduction through the wall of the plastic pylon tube 40. This heating of the pylon tube 40 itself, combined with the upward thrusting force of the arrangement 10 according to the invention (i.e. in the illustrated embodiment approximately sixty pounds), is sufficient to allow the pylon tube 40 to break through a considerable glazing of ice on the surface 19 of the roadway. Since ice formation at the interface between 20 the pylon tube 40 and the upper flange 30 poses the greatest potential for seizure of the arrangement 10 during harsh weather conditions, the mounting of the heating unit 85 at the top of the drive shaft 18 just below the roadway surface 19 is an optimum location. 25 actuation of the heating unit 85 is controlled via the control board 55A, and may be controlled with a timer which actuates the heating unit 85 intermittently based upon weather conditions, or as otherwise appropriate. The lighting arrangement 86 which is also mounted within 30 the interior of the pylon tube 40 atop drive shaft 18 and just below the roadway surface 19 illuminates the entire pylon tube 40 when in the fully extended position.

Some applications of the pylon arrangement 10 according to the invention for the control of vehicular traffic include toll collection lanes, weighing stations, parking lots, railroad crossings, reversible traffic

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lanes, HOV lanes, and tunnel and bridge entrances. For pedestrian applications, the flexible pylon tube 40 may be utilized or can be replaced with a more rigid pylon which could potentially include hooks or supports for handrails, lights or lasers, for example. The arrangement according to the invention can be used to remotely control pedestrian flow in amusement parts, stadiums, tourist and shopping areas by controlling groups of pylon arrangements. When use of the pylons is unnecessary, the pylons are unobtrusively stored beneath ground level.

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It will be appreciated that the linear drive 54 disclosed herein is only one example of a preferred commercially available product sold under the name "ZERO-15 MAX" which may be utilized according to the invention. Other types of linear drives which may conceivably be utilized in accordance with the invention are disclosed in U.S. Patent Nos. 4 411 166 and 3 272 021, which are hereby incorporated by reference herein.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.